International Journal of Computational and Experimental Science and ENgineering (IJCESEN)

Vol. 11-No.2 (2025) pp. 2064-2067
http://www.ijcesen.com

ISSN: 2149-9144

Research Article

Measuring execution time of messages within the Moodle 3.2 platform on a local server

Basri Ahmedi[1], Lindita Loku Nikci[2], Aferdita Ibrahimi[3*]

[1]Public University Kadri Zeka, Faculty of Computer Sciences, rr."Zija Shemsiu" pn. 60000 Gjilan, Republic of Kosovo
Email: basri.ahmedi@uni-gjilan.net - **ORCID:** 0000-0002-6572-550X

[2]Public University Kadri Zeka, Faculty of Computer Sciences, rr."Zija Shemsiu" pn. 60000 Gjilan, Republic of Kosovo
Email: lindita.loku@uni-gjilan.net - **ORCID:** 0009-0000-9848-7993

[3]Public University Kadri Zeka, Faculty of Computer Sciences, rr."Zija Shemsiu" pn. 60000 Gjilan, Republic of Kosovo
***Corresponding Author Email:** aferdita.ibrahimi@uni-gjilan.net - **ORCID:** 0009-0003-2058-8091

Article Info:

DOI: 10.22399/ijcesen.1090
Received : 07 February 2025
Accepted : 31 March 2025

Keywords :

Execution time,
Moodle,
Number of participants,
Number of characters,
Local server.

Abstract:

This study investigates the performance of message delivery within the Moodle 3.2 platform hosted on a local university server, which has supported approximately 4,700 users since 2016. The research evaluates execution time as a function of the number of recipients and message size, considering key performance factors such as hardware capabilities, algorithm efficiency, and network conditions. Empirical measurements were conducted on the university's e-learning server (https://e-learning.uni-gjilan.net/) through two types of tests: varying the number of recipients and increasing the number of message characters. Results indicate that increasing the number of recipients significantly impacts execution time, while message size has a comparatively smaller effect. These findings highlight the need for optimizing Moodle configurations and server resources to improve scalability and performance in high-user environments. Recommendations include upgrading server hardware, optimizing database queries, and implementing caching mechanisms. Future research should explore alternative database engines and network configurations to enhance system efficiency further.

1. Introduction

The performance of web applications, particularly those hosted on local servers, is influenced by a multitude of factors. These factors include hardware specifications, operating system configuration, network bandwidth, and the complexity of the underlying algorithms. In the context of learning management systems (LMS), the efficiency of message delivery is crucial for ensuring smooth user experience. This study focuses on the Moodle 3.2 platform, a widely used open-source LMS, to investigate the impact of user load and message size on message delivery time. By conducting a series of controlled experiments, we aim to identify performance bottlenecks and provide insights into optimizing Moodle configurations for improved scalability. Regarding the analysis of algorithms, Time Complexity is the number of steps that must be executed as a function of the size of the inputs. Every desktop application requires minimum hardware requirements, i.e. minimum performance of a PC for execution [1-3]. In this case, the execution time of sending a message from this server through the Moodle application is treated as an element for analysis. This message is executed on the Moodle 3.2 platform which is located on the local server of the university. At the moment the button to send the message is pressed, the server, more precisely the Moodle 3.2 platform, starts the execution of this algorithm. On the Moodle platform, the generation of the code for the action of sending messages can be seen. In the same code, the start and end times of this algorithm can also be read, as well as the length of the generated code. From here, all the measurements for analysis are taken. Here, the time and code that the server needs to send a message are read, depending on the number of clients to whom the message is sent and the number of characters in the message [4]. Two types of execution time measurements are made on the local UKZ server. One is by increasing the number of clients to whom the message is sent and the other measurement when the number of characters in the message increases.

Through empirical measurements it is observed that increasing the number of clients to whom the message is sent by the server also increases the execution time, while when increasing the characters in the message content we have a small increase in execution time.

2. Execution time in server

Every application has minimum hardware requirements on which it can be executed. This is often noted in the application package that reaches the commercial use phase. Applications installed on the server as web applications will not only depend on the server hardware performance but also on other parameters [5-7]. Some of these parameters are: Bandwidth, number of users, amount of load etc. In this paper we have measured and analyses the execution time of sending a message using the Moodle 3.2 which is on the local server of the university that provides e-Learning services [4]. This is seen in Figure 1.

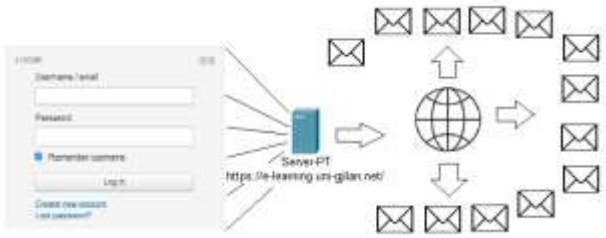

Figure 1. *Platform Moodle ver.3.2*

The execution time was read from the code generated in the Moodle 3.2 application located on the local server. Several measurements were made. For all samples, after the message sending button was pressed, the execution time for all steps of the message sending algorithm started. From the beginning to the end of this algorithm in Moodle, depending on the number of clients, different code sizes and different execution times were generated. This is reported by the application and there for all samples the time in software seconds can be read. The execution time $T=t_2-t_1$ for each sample is obtained as the difference between the end of the execution time t2 and the start time of the message sending algorithm steps t1 [1,4,8,9,10]. Part of the code received from the server for a measurement is shown in Figure 2. Moodle as an application can be used in several ways by installing it on the institution's local server or on a cloud server. A simpler way is to deploy it on a local server of the institution. In the absence of a high-performance server, a PC can be configured as a server to provide the same services. The hardware performance of the PC that currently serves as a local server is: Intel (R)

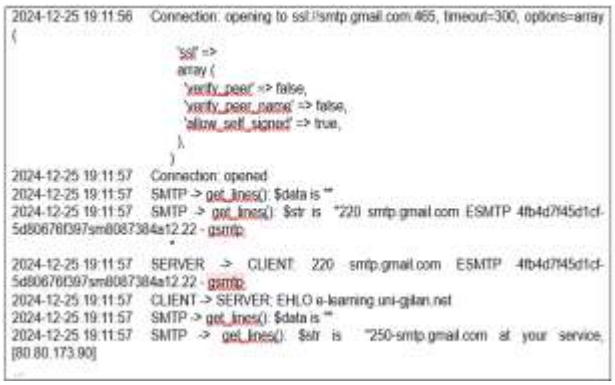

Figure 2. *The piece of code that is generated on the local server at runtime*

Core i3 540 @ 3.07 GHz, RAM: 5.00 GB, HDD: 500 GB. To configure Moodle on the server, the following supporting software was installed: Windows Server R12 with IIS (Internet Information Services), C ++, PHP, MySQL or Maria DB. Finally, Moodle ver 3.2 was installed and the appropriate configuration was made [11-13]. These findings highlight the importance of optimizing Moodle configurations for environments with a large number of users. By identifying the bottlenecks in the message delivery process, administrators can take steps to improve performance, such as upgrading server hardware, optimizing database queries, or implementing caching mechanisms.

3. Results and Discussions

The analysis material was taken from the message generated by the Moodle application ver. 3.2 at the moment the server sends this message to one or more users. Two situations were analyzed and measurements were made. One situation is when a message is sent that carries only one character, i.e. the same message size, but is sent to several users such as 1, 10, 20, 30, 40, 50 users (email addresses). For this study, when we increase the number of users from 1 to 50, it is seen that the execution time increases. This is seen in Table 1. The method used has been empirically proven. So, two types of measurements were made, which are:

-Measurements of the first type were made when the message size was kept constant, i.e. only one character is carried but the number of users increases and the execution time is measured. The measurement results are seen in Table 1.

- Measurements of the second log were made when the number of characters sent by the message and the number of users increased, and the execution time was measured 6 execution time measurements were made for a message that carried different numbers of these characters: 1, 10, 20, 30, 40, 50. The results of the measurements are in Table 2. From the data that

emerged from the measurements, it can be seen that the execution time is approximately the same as in the first case when the message had only one character. Figure 3 is comparison of execution time for one character and several users in the message from the local server. Figure 4 shows comparison of execution time for several characters and several users in the message from the local server. Our experimental results demonstrate a clear correlation between the number of recipients and message delivery time. As the number of recipients increases, the time required to deliver a message also increases. Interestingly, the size of the message had a less pronounced impact on overall performance. While larger messages did result in slightly longer execution times, the effect was not as significant as the impact of the number of recipients. These findings align with our hypothesis that the number of recipients would be the primary factor affecting message delivery time. However, the relatively minor impact of message size indicates that the Moodle platform is reasonably efficient in handling messages of varying lengths. It is important to note that this study has several limitations. First, the experiments were conducted on a specific Moodle installation with a particular hardware configuration and network setup. Therefore, the results may not be generalizable to other Moodle environments. Second, we focused on a single type of message (standard text messages) and did not consider other types of content, such as attachments or multimedia files.

4. Conclusions

This study investigated the impact of user load and message size on the performance of message

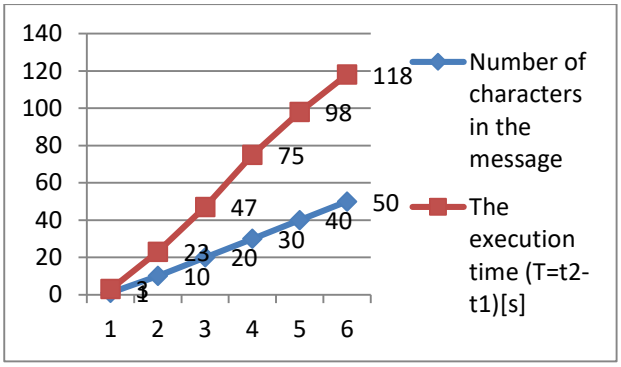

Figure 3. *Comparison of execution time for one character and several users*

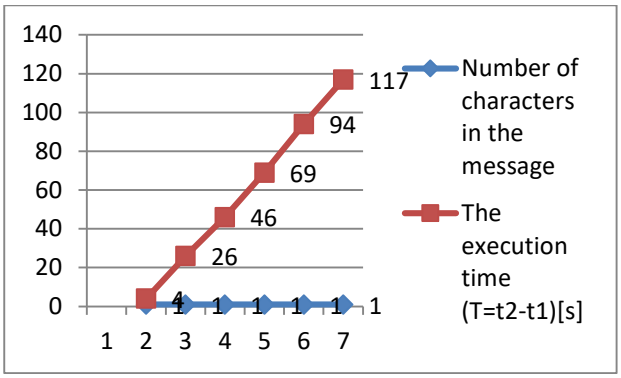

Figure 4. *Comparison of execution time for several characters and several users*

Table 1. *Local server execution time measurement for 1 to 50 users when message has constant load of one character*

Number of characters in the message	The number of users [n]	Start time in seconds(t_1)	Timeout in seconds(t_2)	The execution time ($T=t_2-t_1$)[s]	Code generation from local server measured in words	Code generation from local server measured in page format A4
1	1	19:11:56	19:12:00	4	952	7
1	10	19:57:30	19:57:56	26	9553	56
1	20	20:06:09	20:06:55	46	17196	117
1	30	20:10:52	20:12:01	69	25792	176
1	40	20:22:34	20:24:08	94	36305	247
1	50	20:34:00	20:35:57	117	47775	325

Table 2. *Measurement of execution time from the local server for 1 to 50 users when the number of characters in the message increases*

Number of characters in the message	The number of users [n]	Start time in seconds(t_1)	Timeout in seconds(t_2)	The execution time ($T=t_2-t_1$)[s]	Code generation from local server measured in words	Code generation from local server measured in page A4
1	1	21:08:35	21:08:38	3	952	7
10	10	21:11:37	21:12:00	23	9565	64
20	20	21:17:02	21:17:49	47	19129	130
30	30	21:24:16	21:25:31	75	28695	195
40	40	21:32:50	21:34:28	98	37298	254
50	50	21:53:37	21:54:35	118	47819	326

delivery within a Moodle 3.2 instance hosted on a local server. Our experimental results demonstrate a clear correlation between the number of recipients and message delivery time, indicating that increasing the number of users significantly increases the system load. In contrast, the size of the message had a less pronounced effect on performance. These findings highlight the importance of optimizing Moodle configurations for environments with a large number of users. To improve performance, administrators should consider strategies such as:

Upgrading server hardware: Increasing the processing power and memory of the server can improve its ability to handle a larger workload.

Future research could explore the impact of different Moodle configurations, such as using a different database engine or caching mechanism. Additionally, investigating the performance of message delivery under different network conditions would be valuable. Further studies could provide a deeper understanding of Moodle's performance factors and lead to more effective optimization strategies.

Author Statements:

- **Ethical approval:** The conducted research is not related to either human or animal use.
- **Conflict of interest:** The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper
- **Acknowledgement:** The authors declare that they have nobody or no-company to acknowledge.
- **Author contributions:** The authors declare that they have equal right on this paper.
- **Funding information:** The authors declare that there is no funding to be acknowledged.
- **Data availability statement:** The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

References

[1]D. Evans, Introduction to computing, Charlottesville: University of Virginia , 2011.

[2]T. H. Cormen, C. E. Leiserson, R. L. Rivest and C. Stein, (2022). Introduction to Algorithms, Cambridge, Massachusetts London: Massachusetts Institute of Technology , *The MIT Press*.

[3]S. Esakkiammal, & K. Kasturi. (2024). Advancing Educational Outcomes with Artificial Intelligence: Challenges, Opportunities, And Future Directions. *International Journal of Computational and Experimental Science and Engineering*, 10(4). https://doi.org/10.22399/ijcesen.799

[4]K. Z. K. Universiteti Publik, "Public University Kadri Zeka," 25 12 2024. [Online]. Available: https://uni-gjilan.net/, https://e-learning.uni-gjilan.net/. [Accessed 25 12 2024]. https://e-learning.uni-gjilan.net/

[5]J. Hennessy and . D. Patterson, Computer Architecture -A Quantitative Approach, Waltham, MA 02451, USA: Elsevier, 2012.

[6]B. Rupprecht, B. Vogel-Heuser and E.-M. Neumann, "Measurement Methods for Software Execution Time on Heterogeneous Edge Devices," in *2023 IEEE 21st International Conference on Industrial Informatics (INDIN)*, Lemgo, Germany, 2023. https://ieeexplore.ieee.org/document/10218136

[7]M, S., S, P., K, D., T, V., & D, B. (2024). Enhanced Energy efficient routing protocol for OnDemand distance vector routing to improve communication in border area Military communication. *International Journal of Computational and Experimental Science and Engineering*, 10(4). https://doi.org/10.22399/ijcesen.492

[8]T. Fryza and M. Waldecker, "Precise Measurement of Power Consumption and Execution Time for Embedded Platforms," in *2018 25th International Conference on Systems, Signals and Image Processing (IWSSIP)*, Maribor, Slovenia, 2018. https://ieeexplore.ieee.org/document/8439486

[9]Y. Seo and H. S. Kim, "Operator-data type pair based execution environments independent worst-case execution time measuring method," in *2016 IEEE/ACIS 15th International Conference on Computer and Information Science (ICIS)*, *IEEE*, Okayama, Japan, 2016. https://ieeexplore.ieee.org/document/7550831

[10]Sankari, A. S., & S. Vimalanand. (2024). Biased Random Sampling with Firefly Optimization (BRS-FO) based on Load Balancing for Virtual Machine Migration in Cloud Computing. *International Journal of Computational and Experimental Science and Engineering*, 10(4). https://doi.org/10.22399/ijcesen.753

[11]A. Büchner (2022), Moodle 4 Administration: An administrator's guide to configuring, securing, customizing, and extending Moodle, *Birmingham, UK: Packt Publishing.*

[12]X. T. R. M. A. D. Basri Ahmedi, (2018). Development of Massive Open Online Courses, Chapter Five," in *Innovations, Technologies and Research in Education*, Riga, Latvia, Cambridge Scholars Publishing, pp. 51-63.

[13]B. Ahmedi, X. Thaqi and E. Halimi, "The advantages of Creating a New Account in Moodle by Users Themselves and by the Administrations,," in *IAFeS Edition, Volume 6,*, Corfuz, Greece, 2018.